

“Insects are only attracted to unhealthy plants because they're more digestible.”

# Overcoming autumn challenges

## Technical Pushing performance

Sometimes crops need a helping hand to get through their most vulnerable stages when growth relies on a small solar panel and a delicate root system. CPM looks at ways of achieving this.

By Lucy de la Pasture

**Getting crops off to a good start in the autumn is always a key objective for growers and agronomists. Healthy plants with larger root systems are more resilient when conditions become unfavourable and better able to shrug off pest and disease attacks.**

The loss of neonics in both autumn cereals and oilseed rape has created a whole new set of pest challenges. Culturally, a move to later drilling is suggested as being the best way to reduce the impact of both BYDV in cereals and cabbage stem flea beetle larvae in OSR. But is there more that can be done agronomically, by influencing the health of the plant itself?

The functional immunity of plants is something that's seldom talked about in farming, but it's a real phenomenon and something growers can tap into to mitigate the effects of pest and disease attacks, according to US entomologist, Dr Tom Dykstra. He's been researching the relationship between plant health and insect behaviour for over 20 years and has come

up with some interesting findings.

Producing crops is about maximising the capture of solar energy from the sun for the production of energy and sugars in the plant, he explains. "By increasing the photosynthetic capability of plants there's an increase in carbon sequestration and also plant health. Insects are only attracted to unhealthy plants because they're more digestible."

### Electromagnetic vibrations

Tom has found that plants 'advertise' themselves to insects as unhealthy by sending out electromagnetic vibrations and insects tune into these particular frequencies. He says healthy plants aren't digestible to insects so although they may be probed, insects will quickly move on to find a more readily digestible source of food. That means when plants are functioning at their optimal health then they're no longer vulnerable to insect attack, something many OSR growers would give their eye teeth for.

So how can you tell how 'healthy' a plant is? Tom describes a direct correlation between plant health and photosynthesis, so the health status can be gauged by assessing the sugar content in the leaf. This can be done using a Brix refractometer and according to test results, commercial crops generally have a lot of room for improvement, he believes.

"Most commercial crops have a Brix reading of 4-8. Only when they reach Brix 12 or above do plants become unattractive to insects and all insect damage stops. Brix 14 is the optimal level for plant health," he says.

"That means many plants are suffering as they're not working anywhere near their photosynthetic potential, so even small

improvements in Brix help the crop," he adds.

So with crop plants mostly operating at a compromised capacity, minimising the stresses it comes under is wise but how is this achievable in practice? The reality for many UK wheat crops where blackgrass control is a priority, is that they emerge through a stack of residual herbicides which form the backbone of blackgrass control strategies.

Agrii agronomist, Matthew Clark, believes the addition of adjuvant Backrow to the residual mix of herbicides has a role to play in preventing phytotoxicity.

"We're loading chemistry at the pre-emergence and peri-emergence timings to get control of blackgrass. Residual stacking can pose a threat to crop safety if rain leaches the herbicides down the soil profile into the crop's rooting zone. Backrow helps retain the residuals in the top 5cm, the weed rooting zone, which is where they're needed to work effectively," he says.

A crop that hasn't been knocked about by herbicide will be healthier and more ▶



Autumn application of Bridgeway could help OSR through stressful periods at a critical time in the crop's growth.



Stuart Sutherland says the research Interagro is doing demonstrates that peptide signalling plays a role in various aspects of plant growth and development.

► competitive against germinating weeds, but Backrow has other advantages which translate into an increased level of blackgrass control, explains Matthew.

"We need to get 98% control of blackgrass to stop the problem from escalating and that's not easy to achieve, every little bit helps. We've looked at adjuvants extensively in Agrii trials and have found Backrow contributes an average of 9% increase in blackgrass control when it's added to residual herbicides.

Backrow is a drift retardant, but this feature alone doesn't fully explain why it's consistently improved herbicide performance in the field. It also has the ability to increase the uniformity of spray droplets to produce a more predictable spectrum, giving improved deposition on the soil surface.

This better coverage of the soil means more germinating weeds come into contact with the pre-em herbicides at emergence, which helps account for the increase in efficacy seen in trials, says Matthew.

"You could say Backrow is helping eek out every last ounce of activity from the herbicide," he says.

Fellow Agrii agronomist Paul Foster agrees that Backrow has become a standard treatment at the pre/peri-em timings.

"It's another piece of the jigsaw when it comes to blackgrass because it adds a few more percentage points to its control," he says.

Matthew finds Backrow a useful addition to the tank with pre-em herbicides for winter beans. "Again we're loading the crop with pre-em residuals for blackgrass control. It's really important to hold the herbicide in the top 5cm for as long as possible in a crop that's not very competitive and can be sensitive to the phytotoxic effects of some

herbicides," he adds.

As well as reducing the impact of herbicides on the crop, there are also agronomic tweaks that can improve resilience to abiotic stress, support photosynthesis and ultimately crop health. And this is where biostimulants could have a role in the autumn, says Interagro's Sarah Ferrie.

## Glasshouse studies

Work conducted in the glasshouse at the University of Nottingham has looked at the effects of the biostimulant, Bridgeway (or Zonda) on root and shoot growth in both wheat and oilseed rape plants. Stress tests were imposed to mimic the effects of drought, heat and low nutrient availability and compared with a control.

"In the wheat treatments, all Bridgeway treatments significantly improved root and shoot growth over the untreated. The greatest effect was on rooting, which increased by 34% in 2018 and 47% in 2019," explains Dr Steve Rossall, who conducted the research. He puts the increased root growth in 2019 down to a later date of assessment after planting, which was 6 days later than in the previous year so the roots had more growing time.

In OSR plants the effect was even more impressive. "At 1.0 l/ha the root growth increased by 82% with an increase in shoot growth of 27%. At the 2.0 l/ha rate, there was a 112% increase in rooting, with a 43% increase in shoot growth," he says.

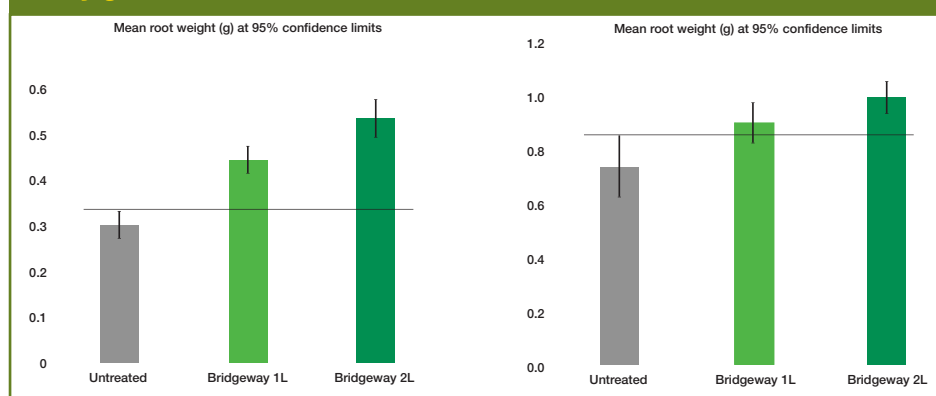
Commenting on the work at the University of Nottingham, Interagro's technical manager Stuart Sutherland says, "The research we're doing clearly demonstrates that peptide (chains of amino acids) signalling plays an even greater than anticipated role in various aspects of plant growth and development.

"The plant hormones ethylene, auxins, gibberellins, cytokinins, abscisic acid have long been considered the major signalling molecules but research in the last 5-8 years has shown that peptides play a crucial role in signalling and stress responses."

"I believe these results show that the amino acids and peptides in Bridgeway and Zonda play a key role in plant growth, development and stress defence. It's something growers and agronomists could take full advantage of as soon as crops go in the ground to put them in the best position," he says.

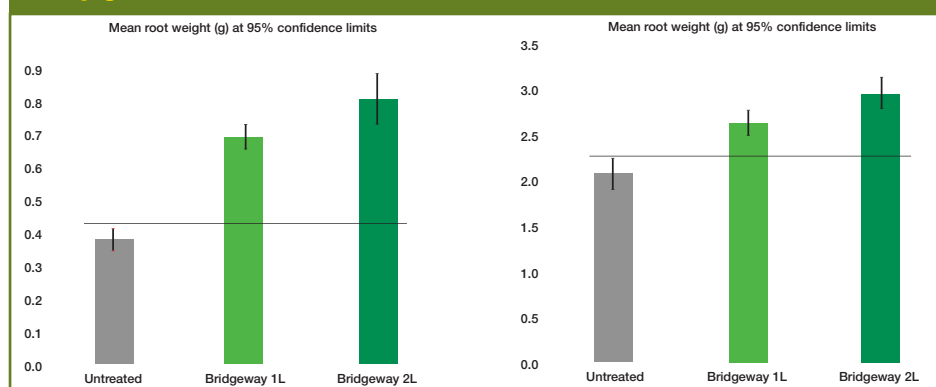
Steve is more cautious in his interpretation and is of the opinion more research needs to be carried out to understand the

## Early growth studies in wheat



Research conducted at University of Nottingham 2019. Bridgeway applied at GS14. Trials terminated after 28 days.

## Early growth studies in OSR



Research conducted at University of Nottingham 2019. 2.0 l/ha Bridgeway applied at GS11-12. Trials terminated after 30 days.

mechanism. "Something is clearly happening to get these increases under optimum conditions in root and shoot growth in the glasshouse, but I don't believe it's likely to be as simple as amino acids being the building blocks for proteins.

"Something is changing at a molecular level in the growth instructions to the plant and we need to explore this to truly understand what's going on," he comments.

Even though the true mechanism may still be a matter of some debate, Stuart highlights that good rooting, especially deep rooting, will enhance crop growth when water or N is limiting.

"Increases in shoot growth not only provide a bigger solar panel for photosynthesis but produce a crop with more biomass and this is likely to produce a crop more tolerant to pest attack, such as cabbage stem flea beetle," he says.

Interagro are supporting Bridgeway /Zonda this autumn with a recommendation of 1.0 to 2.0 l/ha from the two true leaf stage in OSR and cereals. From the work of Tom Dykstra, even small gains in the photosynthetic capability of crops can pay dividends in making them less attractive to pests, so it follows that an autumn biostimulant application could prove useful in some situations.

"For growers choosing to stick with winter OSR, establishing a crop with get-up-and-go will be crucial to mitigate the threats of cabbage stem flea beetle and environmental stresses as we saw last autumn, when conditions were very dry.

"The tiny OSR seed only has sufficient nutrients and energy to grow a small root system before having to rely on nutrients from the soil. An early application of Bridgeway can be a useful insurance to promote faster establishment, possibly

helping plants move away from early cabbage stem flea beetle pressure, and also offers greater tolerance to the effects of stress, such as drought and crop protection applications," explains Sarah.

Many growers will want the assurance that the crop they've planted is going to establish before spending additional money on it and this has been the trend for a number of years now. But Sarah emphasises the flexibility in the Bridgeway timing.

"There's no timing restriction on Bridgeway applications but building plant health early will produce a crop that establishes faster and is more resilient to the issues it is likely to face as the season develops," she says.

## No separate pass

"There's no need to make a separate pass with Bridgeway. It has an excellent safety and compatibility profile and can be added to the tank when going in with post-emergence herbicide applications, fungicide or insecticide, for example. In fact, we'd actively promote it to limit the stress induced behaviours caused by crop protection application, so crop establishment continues unchecked," she adds.

"Herbicides in particular can 'check' the crop, and it's believed the amino acids and peptides in Bridgeway help to counter this by enhancing herbicide detoxification mechanisms in the crop.

Sarah goes on to explain stress induced behaviours and how Bridgeway helps crop plants in more detail.

"Most herbicides control weeds by targeting and inhibiting proteins or enzymes in plants. Amino-acid biosynthesis inhibiting herbicides inhibit enzymes of the plant and consequently block the biosynthesis of the building blocks of protein — amino acids.



Steve Rossall says that in glasshouse experiments, Bridgeway significantly increased root growth.

There are many different types, but this is how SUs work, for example.

"Sometimes there's also an impact on the crop, which impacts the carbon and nitrogen metabolism and affects the photosynthetic rate of the crop. But the production of leafy biomass requires a large amount of N for the production of chlorophyll, which is critical in photosynthesis. So there's a knock-on effect which ultimately impacts on crop vigour and yield potential." ■

## Pushing performance

At the heart of good crop production lies careful use of chemistry to protect the plant and maintain performance, right through the season. But optimising the efficacy of plant protection products can be challenging, while increasingly restrictive regulations limit just how far you can go.

This series of articles explores the science behind the use of adjuvant and biostimulant tools to help power both chemistry and crop performance, as well as increase understanding of why they're needed and what they do. We're setting out to empower growers and drive crops to reach their full potential.

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Bridgeway and Zonda are amino acid biostimulants exclusively of plant origin designed to improve plant health. Backrow is an adjuvant designed for use with pre-/peri-emergence herbicides to help power effective weed control in a wide range of crops.



## Effect of Bridgeway on root growth



Research conducted at University of Nottingham 2019. Bridgeway applied at GS11-12. Trials terminated after 30 days.